SEDIMENTOLOGICAL MODEL OF THE LOWER MIDDLE JURASSIC DEPOSITS IN THE SOUTH-EAST OF WESTERN SIBERIA

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The Western Siberian oil and gas province is located within the largest lowland of the same name in the world, in the West it borders on the Hercynian deposits of the Urals, in the East the province is confined by tectonic structures of the Yenisei Ridge and the Central Siberian ancient Paleozoic platform, in the south it borders with the Kazakh area and the Sayano-Altaisky mountain region, northward is submerged under the waters of the Kara Sea and is the largest oil and gas basin in the world, the most important territory for the extraction of hydrocarbons on an industrial scale. Tomsk Oblast which is located in the southeastern part of Western Siberia, forms the third center of oil production in the region. The main hydrocarbon reserves are concentrated in the Pre-Jurassic (Tabaganskaya (C_1t-s_1), Luginetskaya (D_3f-fm), Gerasimovskaya (D_2ef-zv_{1-2}) formations, Lower-Middle Jurassic (J_{1-2}), Vasyugansky (J_3), Bazhenovo-Abalaksky (J_3-K_1), Neocomian (K_1) oil and gas complexes [1].

In the south-east of Western Siberia (Tomsk Oblast), hard-to-recover reserves of the Lower Middle Jurassic productive deposits are of great interest to date due to the growth in the resource base and increase in oil production. The relevance of the study in the Lower-Middle Jurassic deposits of the southeastern part of the Western Siberian Plate in the Tomsk Oblast is of no doubt due to the increased oil and gas content and poor knowledge in this sphere. As drilling increases, there is a growing awareness of great complexity of productive reservoir structure. Today, the conditions of formation deposits in the region and data on lithology, which are the basis of the oil and gas field parameters, need to be clarified from the point of view of modern views.

The Lower-Middle Jurassic deposits in the study area are represented by the Gettang-Early-Toarsky oil and gas bearing complex consisting of alternating coastal-marine and lacustrine-alluvial sandy-clayey and shallow-marine sediments, Late-Toar-Aalensky and Bayos-Batsky oil and gas promising complexes consisting of stratigraphically shielded sand beds with industrial hydrocarbon reserves. In the early Middle Jurassic, sedimentation in the study area occurred under the frequently changing paleogeographic conditions and was accompanied by the change in various forms of relief, which probably served as the formation of complex reservoirs with reduced reservoir properties.

The issues of the geological structure and conditions for the formation of the Lower Middle Jurassic deposits in the territory of the Western Siberian oil and gas province are considered in the works by many Soviet and Russian geologists: G.F. Stepanenko and L.S. Chernova (1998), M.Y. Zubkov (1999, 2001), M.F. Pecherkin, V.V. Shelepov (1999), G.F. Ilina (2002), N.M. Nedolivko (2003), T.G. Ten (2003), E.E. Danenberg, V.B. Belozerov, N.A. Brylina (2006), O.S. Chernova (1995, 2010, 2014) and many other researchers. Despite the considerable lithological study of these formations, many questions concerning the petrophysical rationale for the development of these reservoirs remain open. In this connection, a detailed study of the structural features of complex low-permeability reservoirs, concentrated in the sediments of the lower-middle Jurassic, can be approached only by integrating lithological-petrophysical methods for studying terrigenous sedimentary strata.

We have developed a comprehensive method for studying the Lower-Middle Jurassic oil and gas bearing deposits in the south of Western Siberia including the study of core material to determine the genesis of the sediments described, further building paleogeographic reconstructions for the time of accumulation of the lower and middle Jurassic reservoirs in the area under study, modeling sedimentological environments for the core wells and building complex static 3D models.

References

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